KEITHLEY

Model 2000

Multimeter

Quick Reference Guide

Model 2000 Multimeter
Quick Reference Guide

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Test Instrumentation Group
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Safety Precautions

The following safety precautions should be observed before using this product and any associated instrumentation. Although some instruments and accessories would normally be used with non-hazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read the operating information carefully before using the product.

The types of product users are:

Responsible body is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the manual. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, and perform safe installations and repairs of products. Only properly trained service personnel may perform installation and service procedures.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks

or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30V RMS, 42.4V peak, or 60VDC are present. **A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.**

Users of this product must be protected from electric shock at all times. The responsible body must ensure that users are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product users in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, **no conductive part of the circuit may be exposed.**

As described in the International Electrotechnical Commission (IEC) Standard IEC 664, digital multimeter measuring circuits (e.g., Keithley Models 175A, 199, 2000, 2001, 2002, and 2010) are Installation Category II. All other instruments' signal terminals are Installation Category I and must not be connected to mains.

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Before operating an instrument, make sure the line cord is connected to a properly grounded power receptacle. Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such

as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

The instrument and accessories must be used in accordance with its specifications and operating instructions or the safety of the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.

When fuses are used in a product, replace with same type and rating for continued protection against fire hazard.

Chassis connections must only be used as shield connections for measuring circuits, NOT as safety earth ground connections.

If you are using a test fixture, keep the lid closed while power is applied to the device under test. Safe operation requires the use of a lid interlock.

If a screw is present, connect it to safety earth ground using the wire recommended in the user documentation.

The symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

The symbol on an instrument shows that it can source or measure 1000 volts or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.

The **WARNING** heading in a manual explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The **CAUTION** heading in a manual explains hazards that could damage the instrument. Such damage may invalidate the warranty.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits, including the power transformer, test leads, and input jacks, must be purchased from Keithley Instruments. Standard fuses, with applicable national safety approvals, may be used if the rating and type are the same. Other components that are not safety related may be purchased from other suppliers as long as they are equivalent to the original component. (Note that selected parts should be purchased only through Keithley Instruments to maintain accuracy and functionality of the product.) If you are unsure about the applicability of a replacement component, call a Keithley Instruments office for information.

To clean an instrument, use a damp cloth or mild, water based cleaner. Clean the exterior of the instrument only. Do not apply cleaner directly to the instrument or allow liquids to enter or spill on the instrument. Products that consist of a circuit board with no case or chassis (e.g., data acquisition board for installation into a computer) should never require cleaning if handled according to instructions. If the board becomes contaminated and operation is affected, the board should be returned to the factory for proper cleaning/servicing.

Introduction

This quick reference guide includes summary information on front panel and remote operation for the Model 2000 Multimeter. For detailed operating information, consult the Model 2000 User's Manual.

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Front Panel Operation Summary

Power-on defaults

Power-on defaults are those settings the instrument assumes when it is turned on. The Model 2000 offers two choices for the settings: user or factory. With user, the instrument will power-on to the settings stored in memory by the operator. With factory, the instrument will power on to the factory default settings.

To store a user configuration in memory:

1. Configure the instrument as desired for USER default.
2. Press SHIFT and the SAVE.
3. Use the ▲ and ▼ keys to select YES. Note: Select NO if you do not wish to change the user setup that is stored in memory.
4. Press ENTER.

To restore factory or user settings:

1. Press SHIFT and then SETUP.
2. Use the ▲ and ▼ keys to select FACTory or USER.
3. Press ENTER.

NOTE: Factory default settings are listed in Table 2.

Instrument connections

Basic connections for Model 2000 measurements are shown in Figure 1. These drawings show connections to the front panel terminals (INPUTS switch in the FRONT position). If using the rear panel terminals, place the INPUTS switch in the REAR position. Note that current

(DCI and ACI) measurements cannot be made from the rear panel terminals.

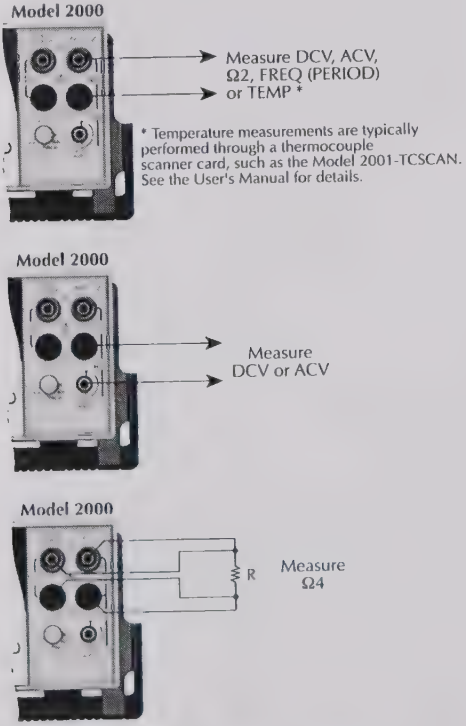

Figure 1. Basic measurement connections

For resistance measurements (Ω2 and Ω4) greater than 100kΩ, more stable readings can be achieved by using shielding. Place the resistance in a shielded enclosure and connect the shield to INPUT LO. Shielded cable should be used such that the shield (INPUT LO) encircles the other cable conductor(s).

Maximum inputs for the Model 2000 are summarized in Table 1.

Table 1. Maximum inputs

Function	Maximum input
DCV	1000V peak
ACV	750V rms, 1000V peak, 8×10^7V•Hz
DCI	3A dc
ACI	3A rms
FREQ (PERIOD)	1000V peak, 8×10^7V•Hz

Basic measurement procedure

1. Connect the instrument as explained in "Instrument connection".
2. From the function keys, select the desired measurement function.
3. Use the RANGE keys to select autoranging or a manual range. Pressing the AUTO range key toggles autoranging. You can select a different range with the ▲ and ▼ RANGE keys.
4. Take a reading from the display.

Storing readings (2 to 1024)

1. Set up the instrument for the desired configuration.
2. Press the STORE key.
3. Use the ◀, ▶, ▲ and ▼ keys to select the number of readings to store in the buffer.
4. Press ENTER to start the storage process. The asterisk (*) annunciator will turn off when the storage is finished.

Recalling readings

1. Press the RECALL key. The BUFFER annunciator indicates that stored readings are being displayed. The arrow annunciator indicates that there is more data in the buffer.
2. Use the ◀, ▶, ▲ and ▼ keys to view in the buffer. Note that in addition to the readings, statistical data is available; standard deviation, average, minimum and maximum.
3. Use the EXIT key to return to the normal display.

Changing speed, resolution and filter

RATE — Measurement speed (reading RATE) can be changed for any measurement function except frequency, period, continuity and diode test. Use the RATE key to select FAST, MEDium or SLOW. Use FAST (0.1 PLC) if speed is of primary importance (at the expense of increased noise and fewer usable digits of resolution). SLOW (10 PLC) provides better noise performance at the expense of speed. MEDium (1 PLC) provides a compromise between noise and speed.

DIGITS — Display resolution can be changed for any measurement function. Use the DIGITS key to select the desired number of digits (3½ to 6½).

FILTER — Filter state (on/off) and configuration can be changed for any measurement function, except frequency, period, continuity and diode test. The FILTER key toggles between filter on (FILT annunciator on) and filter off. After pressing FILTER to enable the filter, you can then enter the filter count (1 to 100), and select the filter type (moving or repeating).

Changing temperature measurement configuration

Press SHIFT and then TCOUPL. Three choices are available using the ▲ and ▼ keys:

- UNITS — C, K or F. Specify units.
- TYPE — J, K or T. Specify thermocouple type.
- JUNC — SIM or CHI. Simulate a reference junction temperature (for direct thermocouple connection to the INPUT), or use reference junction (channel 1) on switching card.

Relative (rel)

Rel can be used to null offsets or subtract a baseline reading from present and future readings. When rel is enabled by pressing REL (RFL annunciator on), the instrument uses the present readings as the relative value. Subsequent readings will be the difference between the actual input value and the rel value. You can define a rel value for each function. Pressing REL a second time disables rel.

Math

To enable and configure a math operation, press SHIFT and then the desired math key (MX+B, %, dBm or dB). Use the ◀, ▶, ▲ and ▼ keys to configure the math operation and press ENTER when done. Pressing SHIFT and then the related math key a second time disables the math operation.

MX+B

$$Y = mX + b$$

Where: X is the normal display reading
m and b are the user entered constants
Y is the displayed result

Percent (%)

$$\text{Percent} = \frac{\text{Input - Reference}}{\text{Input}} \times 100\%$$

Where: Input is the normal display reading
Reference is the user entered constant
Percent is the displayed result

dBm

$$\text{dBm} = 10 \log \frac{\left(V_{IN}^{\ 2}/Z_{REF}\right)}{1\text{mW}}$$

Where: V_{IN} is the DC or AC input signal
Z_{REF} is the specified reference impedance

dB

$$\text{dB} = 20 \log \frac{|V_{IN}|}{|V_{REF}|}$$

Where: V_{IN} is the DC or AC input signal
V_{REF} is the specified voltage reference impedance

Measuring continuity

With this feature, the instrument alerts you with a beep when a resistance reading is below the set level. To measure continuity, press SHIFT and then CONT. Use the ◀, ▶, ▲ and ▼ keys to set the resistance threshold

level, and press ENTER. Connect the test leads to INPUT HI and LO.

Testing diodes

With this feature, the instrument measures the forward voltage drop of general-purpose diodes and the zener voltage of zener diodes. To test diodes, press SHIFT and then (⊣⊢). Use the ▲ and ▼ keys to select the test current.

Limit operations

With this feature, you can check to see of readings are within ("IN" displayed), below ("LO" displayed) or above ("HI" displayed) specified low and high reading limits. You can also set the instrument to beep when readings are inside or outside of the limit range.

Setting limits — To set limits (absolute values), press SHIFT and then LIMITS to display the high limit. Use the ◀, ▶, ▲ and ▼ keys to enter the desired value, and press ENTER. Enter the low limit value and again press ENTER.

Enabling limits — Press SHIFT and then ON/OFF to display the beeper status. Use the ▲ and ▼ keys to change the beeper status (NEVER, OUTSIDE or INSIDE) and press ENTER to enable limits. Pressing SHIFT and then ON/OFF a second time disables limit operations.

Reading hold

With this feature, an audible beep is sounded when a valid, settled reading is acquired. A valid reading is determined by the specified window and count.

1. Press SHIFT and then HOLD. Select a window percentage and enter a count.

2. Apply the test probes to the signal and wait for the beeper to sound to indicate a valid reading.
3. Remove the hold condition by lifting the probes.

Pressing SHIFT and then HOLD a second time disables Hold.

Triggers

Factory defaults place the instrument in a continuous (immediate) measurement mode. The instrument can be placed in an external trigger mode where a programmed event is required to cause a measurement (device action).

The instrument is placed in the external trigger mode by pressing the EX TRIG key. In this mode, a device action (measurement) will occur when the TRIG key is pressed, a bus trigger (*TRG or GET) is received, or an input trigger via the TRIGGER LINK connector is received. After the device action (measurement), an output trigger occurs and is available at the TRIGGER LINK connector. Refer to the User's Manual for details on using the trigger link. Pressing EX TRIG a second time returns the instrument to continuous operation.

Delay — A programmable delay is available before the device action (measurement) occurs. It can be set manually or an auto delay can be used. To set a delay, press SHIFT and then DELAY. Use the ▲ and ▼ keys to select AUTO or MANual. If MANual is chosen, enter the duration of the delay and press ENTER. The AUTO delay times are listed in Table 3-2 of the User's Manual.

Scan operations

The Model 2000 can be used with an internal scanner card (Model 2000 SCAN or 2001-TCSCAN), or with external scanner cards installed in a switching mainframe (i.e. Model 7001 and 7002).

Step/Scan configuration — A "walk-through" menu is provided to configure stepping or scanning. The main menu is accessed by pressing SHIFT and then CONFIG. Use the ◀, ▶, ▲, ▼ and ENTER keys to select scan type (INTernal or EXTernal), first channel in the scan (MINimum CHANnel), last channel in the scan (MAXimum CHANnel), time between scans, and reading count (RDG CNT).

◀ and ▶ keys — These keys can be used to manually scan through channels on the internal scanner card. Press ▶ to manually increment channels or ◀ to manually decrement channels. Hold down either key to scan continuously.

OPEN and CLOSE keys — Use these keys to open and close channels on the internal scanner card. After pressing CLOSE, use the ◀, ▶, ▲ and ▼ keys to display the desired channel (1 to 10) and press ENTER. Selecting a different channel will cause the previously closed channel to open. For the Ω4 function, CLOSE will close the selected channel and the paired channel. paired channels for the Model 2000 SCAN are 1&6, 2&7, 3&8, 4&9, and 5&10. Channel pairs are similar for the Model 2001-TCSCAN except that channels 1&6 are not paired.

STEP key - Pressing this key starts a stepping operation of consecutive channels, where output triggers are sent after every channel closure.

SCAN key – Pressing this key starts a scanning operation of consecutive channels, where an output trigger is sent at the end of the scan list.

HALT - Pressing SHIFT and then HALT stops stepping or scanning.

Factory default conditions

Table 2. Factory defaults

Function	Next display
Autozero	On
Buffer	No effect
Continuity	
Beeper	On
Digits	4½
Rate	Fast (0.1 PLC)
Threshold	10Ω
Current (AC and DC)	
Digits (AC)	5½
Digits (DC)	6½
Filter	On
Count	10
Mode	Moving average
Range	Auto
Relative	Off
Value	0.0
Rate (AC)	Medium*
Rate (DC)	Medium (1 PLC)
Diode test	
Digits	6½
Range	1mA
Rate	Medium (1 PLC)
Frequency and Period	
Digits	6½
Range	10V
Relative	Off
Value	0.0
Rate	Slow (1 sec)
Function	DCV
GPIB	No effect
Address	(16 at factory)
Language	(SCPI at factory)
Limits	Off
Beeper	Never
High limit	+1
Low limit	-1
mX+b	Off
Scale factor	1.0
Offset	0.0
Percent	Off
Reference	1.0

Table 2. Factory defaults (cont.)

Function	Next display
Resistance (2-wire and 4-wire)	
Digits	6½
Filter	On
Count	10
Mode	Moving average
Range	Auto
Relative	Off
Value	0.0
Rate	Medium (1 PLC)
RS-232	Off
Baud	No effect
Flow	No effect
Tx term	No effect
Scanning	Off
Channels	1-10
Mode	Internal
Temperature	
Digits	5½
Filter	On
Count	10
Mode	Moving average
Junction	Simulated
Temperature	23°C
Relative	Off
Value	0.0
Rate	Medium (1 PLC)
Thermocouple	J
Units	°C
Triggers	
Continuous	On
Delay	Auto
Source	Immediate
Voltage (AC and DC)	
dB reference	No effect
dBm reference	75Ω
Digits (AC)	5½
Digits (DC)	6½
Filter	On
Count	10
Mode	Moving average
Range	Auto
Relative	Off
Value	0.0
Rate (AC)	Medium*
Rate (DC)	Medium (1 PLC)

*DETector:BANDwidth 30

Error and status messages

Table 3. Error and status messages

Number	Description	Event
-440	Query unterminated after indefinite response	EE
-430	Query deadlocked	EE
-420	Query unterminated	EE
-410	Query interrupted	EE
-363	Input buffer overrun	SYS
-350	Queue overflow	SYS
-330	Self-test failed	EE
-314	Save/recall memory lost	EE
-315	Configuration memory lost	EE
-285	Program syntax error	EE
-284	Program currently running	EE
-282	Illegal program name	EE
-281	Cannot create program	EE
-260	Expression error	EE
-241	Hardware missing	EE
-230	Data corrupt or stale	EE
-225	Out of memory	EE
-224	Illegal parameter value	EE
-223	Too much data	EE
-222	Parameter data out of range	EE
-221	Settings conflict	EE
-220	Parameter error	EE
-215	Arm deadlock	EE
-214	Trigger deadlock	EE
-213	Init ignored	EE
-212	Arm ignored	EE
-211	Trigger ignored	EE
-210	Trigger error	EE
-202	Settings lost due to rtl	EE
-201	Invalid while in local	EE
-200	Execution error	EE
-178	Expression data not allowed	EE
-171	Invalid expression	EE
-170	Expression error	EE
-168	Block data not allowed	EE
-161	Invalid block data	EE
-160	Block data error	EE
-158	String data not allowed	EE
-154	String too long	EE
-151	Invalid string data	EE
-150	String data error	EE
-148	Character data not allowed	EE

Table 3. Error and status messages (cont.)

Number	Description	Event
-144	Character data too long	EE
-141	Invalid character data	EE
-140	Character data error	EE
-128	Numeric data not allowed	EE
-124	Too many digits	EE
-123	Exponent too large	EE
-121	Invalid character in number	EE
-120	Numeric data error	EE
-114	Header suffix out of range	EE
-113	Undefined header	EE
-112	Program mnemonic too long	EE
-111	Header separator error	EE
-110	Command header error	EE
-109	Missing parameter	EE
-108	Parameter not allowed	EE
-105	GET not allowed	EE
-104	Data type error	EE
-103	Invalid separator	EE
-102	Syntax error	EE
-101	Invalid character	EE
-100	Command error	EE
+000	No error	SE
+101	Operation complete	SE
+121	Device calibrating	SE
+122	Device settling	SE
+123	Device ranging	SE
+124	Device sweeping	SE
+125	Device measuring	SE
+126	Device calculating	SE
+161	Program running	SE
+171	Waiting in trigger layer	SE
+174	Re-entering the idle layer	SE
+301	Reading overflow	SE
+302	Low limit 1 event	SE
+303	High limit 1 event	SE
+304	Low limit 2 event	SE
+305	High limit 2 event	SE
+306	Reading available	SE
+307	Voltmeter complete	SE
+308	Buffer available	SE
+309	Buffer half full	SE
+310	Buffer full	SE
+311	Buffer overflow	SE

Table 3. Error and status messages (cont.)

Number	Description	Event
	Calibration messages:	
+400	10 vdc zero error	EE
+401	100 vdc zero error	EE
+402	10 vdc full scale error	EE
+403	-10 vdc full scale error	EE
+404	100 vdc full scale error	EE
+405	-100 vdc full scale error	EE
+406	1k 2-w zero error	EE
+407	10k 2-w zero error	EE
+408	100k 2-w zero error	EE
+409	10M 2-w zero error	EE
+410	10M 2-w full scale error	EE
+411	10M 2-w open error	EE
+412	1k 4-w zero error	EE
+413	10k 4-w zero error	EE
+414	100k 4-w zero error	EE
+415	10M 4-w sense lo zero error	EE
+416	1k 4-w full scale error	EE
+417	10k 4-w full scale error	EE
+418	100k 4-w full scale error	EE
+419	1M 4-w full scale error	EE
+420	10M 4-w full scale error	EE
+421	10m adc zero error	EE
+422	100m adc zero error	EE
+423	10m adc full scale error	EE
+424	100m adc full scale error	EE
+425	1 adc full scale error	EE
+438	Date of calibration not set	EE
+439	Next date of calibration not set	EE
+450	100m vac dac error	EE
+451	1 vac dac error	EE
+452	10 vac dac error	EE
+453	100 vac dac error	EE
+454	100m vac zero error	EE
+455	100m vac full scale error	EE
+456	1 vac zero error	EE
+457	1 vac full scale error	EE
+458	1 vac noise error	EE
+459	10 vac zero error	EE
+460	10 vac full scale error	EE
+461	10 vac noise error	EE
+462	100 vac zero error	EE
+463	100 vac full scale error	EE
+464	750 vac zero error	EE
+465	750 vac full scale error	EE
+466	750 vac noise error	EE

Table 3. Error and status messages (cont.)

Number	Description	Event
+467	Post filter offset error	EE
+468	1 aac zero error	EE
+469	1 aac full scale error	EE
+470	3 aac zero error	EE
+471	3 aac full scale error	EE
+472	Input time constant error	EE
+473	Frequency gain error	EE
+490	Calibration Data Invalid	EE
+500	Calibration data invalid	EE
+510	Reading buffer data lost	EE
+511	GPIB address lost	EE
+512	Power-on state lost	EE
+513	AC calibration data lost	EE
+514	DC calibration data lost	EE
+515	Calibration dates lost	EE
+522	GPIB communication language lost	EE
+610	Questionable Calibration	SE
+611	Questionable Temperature	SE
+800	RS-232 Framing Error detected	EE
+802	RS-232 Overrun detected	EE
+803	RS-232 Break detected	EE
+805	Invalid system communication	EE
+806	RS-232 Settings Lost	EE
+807	RS-232 OFLO: Characters Lost	EE
+808	ASCII only with RS-232	EE
+900	Internal System Error	EE
	DDC Status Model:	
+950	DDC Trigger Overrun Error	EE
+951	DDC Interval Overrun Error	EE
+952	DDC Big String Error	EE
+953	DDC Uncalibrated Error	EE
+954	DDC No Scanner Error	EE
+955	DDC Maximum Channel is 4	EE
+956	DDC Maximum Channel is 8	EE
+957	DDC Calibration Locked	EE
+958	DDC Conflict Error	EE
+959	DDC No Remote Error	EE
+960	DDC Mode IDDC Error	EE
+961	DDC Mode IDDCO Error	EE
	Keithley 199 Serial Poll Byte Events:	
+962	DDC Ready	SE
+963	DDC Reading Done	SE
+964	DDC Buffer Half Full	SE
+965	DDC Buffer Full	SE
+966	DDC Reading overflow	SE

Table 3. Error and status messages (cont.)

Number	Description	Event
	Fluke 8842 serial poll byte events:	
+970	Fluke Error	SE
+971	Data Available	SE
+972	Overrange	SE

EE = error event
SE - status event
SYS = system error event

Remote Operation Summary

At the factory, the instrument is set for GPIB bus operation at primary address 16 using the SCPI programming language.

GPIB bus — Use the GPIB bus configuration menu to enable or disable GPIB bus operation (ON or OFF), and to check and/or change the primary address (0 to 30) and language (SCPI, 199, or 8842). The configuration menu is accessed by pressing SHIFT and then GPIB. Commands for the SCPI language are provided in Tables 4 through 15. The DDC commands for the 199 and 8842 languages are provided in Tables 16 and 17.

RS-232 interface — Use the RS-232 interface menu to enable or disable RS-232 interface operation (ON or OFF), and to check and/or change the baud rate (300 to 19.2k), flow control (NONE or XonXoFF) and terminator (LF, CR or LFCR). Note that only the SCPI language commands can be used over the RS-232 interface.

Status structure

Figure 2. Standard event status

Figure 3. Operation event status

Measurement Condition Register
Measurement Event Register
Measurement Event Enable Register
OR
To Measurement Summary Bit (MSB of Status Byte Register, See Figure 6)
BFL = Buffer Full
BHF = Buffer Half Full
BAV = Buffer Available
RAV = Reading Available
HL = High Limit
LL = Low Limit
ROF = Reading Overflow
& = Logical AND
OR = Logical OR

Figure 4. Measurement event status

Figure 5. Questionable event status

Figure 6. Status byte and service request (SRQ)

IEEE-488.2 common commands and queries

Table 4. IEEE-488.2 common commands and queries

Mnemonic	Name	Description
*CLS	Clear status	Clears all event registers and Error Queue.
*ESE <NRf>	Event enable command	Program the Standard Event Enable Register.
*ESE?	Event enable query	Read the Standard Event Enable Register.
*ESR?	Event status register query	Read the Standard Event Enable Register and clear it.
*IDN?	Identification query	Returns the manufacturer, model number, serial number and firmware revision levels of the unit.
*OPC	Operation complete command	Set the Operation Complete bit in the Standard Event Status Register after all pending commands have been executed.
*OPC?	Operation complete query	Places an ASCII "1" into the output queue when all pending selected device operations have been completed.
*OPT?	Option identification query	Returns an ID code that indicates which memory option is installed and whether or not the optional scanner card is installed.
*RCL <NRf>	Recall command	Returns the Model 2000 to the setup configuration stored in the specified memory location.
*RST	Reset command	Returned the Model 2000 to the *RST default conditions.
*SAV <NRf>	Save command	Saves the current setup to the specified memory location.

Table 4. IEEE-488.2 common commands and queries (cont.)

Mnemonic	Name	Description
*SRE <NRf>	Service request enable command	Programs the Service Request Enable Register.
*SRE?	Service request enable query	Reads the Service Request Enable Register.
*STB?	Read status byte query	Reads the Status Byte Register.
*TRG	Trigger command	Sends a bus trigger to the 2000.
*TST?	Self-test query	Performs a checksum test on ROM and returns the result.
*WAI	Wait-to-continue command	Wait until all previous commands are executed.

SCPI command subsystems

Notes:

1. Brackets ([]) are used to denote optional character sets. These optional characters do not have to be included in the program message.
2. Angle brackets (<>) are used to indicate parameter type. Do not use angle brackets in the program message.
3. Upper case characters indicate the short-from version for each command word.

Table 5. Signal oriented measurement commands

Command	Description
:CONFigure:<function>	Places the Model 2000 in a "one-shot" measurement mode for the specified function.
:FETCh?	Requests the latest reading.
:READ?	Performs an :ABORt, :INITiate, and a :FETCh?.
MEASure[:<function>]?	Performs an :ABORt, :CONFigure:<function>, and a :READ?.

Table 6. CALCulate command summary

Command	Description
:CALCulate[1]	Subsystem to control CALC 1:
:FORMat <name>	Select math format (NONE, MXB, PERCent).
:FORMat?	Query math format.
:KMATh	Path to configure math calculations:
:MMFactor <NRf>	Set "m" factor for mx+b (-100e6 to 100e6).
:MMFactor?	Query "m" factor.
:MBFactor <NRf>	Set "b" factor for mx+b (-100e6 to 100e6).
:MBFactor?	Query "b" factor.
:MUNits <name>	Specify units for mx+b reading (three characters 'A' through 'Z').
:MUNits?	Query "mx+b" units.
:PERCent <NRf>	Set target value for PERCent calculation (-100e6 to 100e6).
:ACQuire	Use input signal as target value.
:PERCent?	Query percent.
:STATe <b>	Enable or disable kmath calculation.
:STATe?	Query state of kmath function.
:DATA?	Read result of kmath calculation.
:CALCulate2	Subsystem to control CALC 2:
:FORMat <name>	Select math format: (MEAN, SDEViation, MAXimum, MINimum, or NONE).
:FORMat?	Query math format.
:STATe <b>	Enable or disable calculation.
:STATe?	Query state of math function.
:IMMediate	Recalculate raw input data in buffer.
:IMMediate?	Perform calculation and read result.
:DATA?	Read math result of CALC 2.

Table 6. CALCulate command summary (cont.)

Command	Description
:CALCulate3	Subsystem to control CALC 3 (limit test):
:LIMit[1]	Path to control LIMIT 1 test:
:UPPer	Path to configure upper limit:
[:DATA] <n>	Set upper limit (-100e6 to 100e6).
[:DATA]?	Query upper limit.
:LOWer	Path to configure lower limit:
[:DATA] <n>	Set lower limit (-100e6 to 100e6).
[:DATA]?	Query lower limit.
:STATe <b>	Enable or disable limit test.
:STATe?	Query state of limit test.
:FAIL?	Query test result (1 = pass, 0 = fail).
:CLEAR	Path to clear failed test:
[:IMMediate]	Clear failed test indication.
:AUTO <b>	Enable or disable auto clear.
:AUTO?	Query auto clear.
:IMMediate	Re-perform limit tests.

Table 7. DISPlay command summary

Command	Description
:DISPlay	
[:WINDow[1]]	
:TEXT	Path to control user text messages.
:DATA <a>	Define ASCII message "a" (up to 12 characters).
:DATA?	Query text message.
:STATe <b>	Enable or disable message mode.
:STATe?	Query text message state.
:ENABle <b>	Enable or disable the front panel display.
:ENABle?	Query state of the display.

Table 8. FORMat command summary

Command	Description
:FORMat	
[:DATA] <type>[,<length>]	Select data format: (ASCii, SREal or DREal).
[:DATA]?	Query data format.
:ELEMents <item list>	Specify data elements: (READing, CHANnel, and UNITs).
:ELEMents?	Query data elements.
:BORDer <name>	Select binary byte order: (NORMal or SWAPped).
:BORDer?	Query byte order.

Table 9. ROUTe command summary

Command	Description
:ROUTe	
:CLOSe <list>	Path and command to close specified channel:
:STATe?	Query closed channel.
:OPEN:ALL	Open all channels.
:SCAN	Command path to configure and control scan operations:
[:INTernal] <list>	Specify internal scan list (2 to 10 channels).
[:INTernal]?	Query the internal scan list.
:EXTernal <list>	Specify external scan list (2 to 400 channels).
:EXTernal?	Query the external scan list.
:LSELect <name>	Select scan operation: (INTernal, EXTernal, or NONE).
:LSELect?	Query scan operation.
:MULtiple	Path to control multiple channels:
:CLOSe <list>	Close specified channels.
:STATe?	Query closed channels.
:OPEN <list>	Open specified channels.

Table 10. SENSe command summary

Command	Description
[:SENSe[1]]	
:FUNCtion <name>	Select measurement function: 'VOLTage:AC', VOLTage :DC', RESistance', 'FRESistance', 'CURRent:AC', 'CURRent: DC' , 'FREQuency','TEMPerature', 'PERiod', 'DIODe', "CONTinuity'.
:FUNCtion?	Query function.
:DATA?	Return the last instrument reading.
:HOLD	Path to control Hold feature:
:WINDow <NRf>	Set Hold window (%); 0.01 to 20.
:WINDow?	Query Hold window.
:COUNt <NRf>	Set Hold count; 2 to 100.
:COUNt?	Query Hold count.
:STATe <NRf>	Enable or disable Hold.
:STATe?	Query state of Hold.
:CURRent:AC	Path to configure AC current.
:NPLCycles <n>	Set integration rate (line cycles; 0.01 to 10).
:NPLCycles?	Query line cycle integration rate.
:RANGe	Path to configure measurement range:
[:UPPer] <n>	Select range (0 to 3.03).
[:UPPer]?	Query range.
:AUTO <b>	Enable or disable auto range.
:AUTO?	Query auto range.
:REFerence <n>	Specify reference (-3.03 to 3.03).
:STATe <b>	Enable or disable reference.
:STATe?	Query state of reference.
:ACQuire	Use input signal as reference.
:REFerence?	Query reference value.
:DIGits <n>	Specify measurement resolution (4 to 7).
:DIGits?	Query resolution.
:AVERage	Path to configure and control the filter.
:TCONtrol <name>	Select filter type: (MOVing or REPeat).
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:STATe <b>	Enable or disable filter.
:STATe?	Query state of digital filter.

Table 10. SENSe command summary (cont.)

Command	Description
:CURRent:AC	
:DETector	Path to configure bandwidth:
:BANDwidth <NRf>	Specify bandwidth (3 to 300e3).
:BANDwidth?	Query bandwidth.
:CURRent:DC	Path to configure DC current.
:NPLCycles <n>	Set integration rate (line cycles; 0.01 to 10).
:NPLCycles?	Query line cycle integration rate.
:RANGe	Path to configure measurement range:
[:UPPer] <n>	Select range (0 to 3.03).
[:UPPer]?	Query range.
:AUTO <b>	Enable or disable auto range.
:AUTO?	Query auto range.
:REFerence <n>	Specify reference (-3.03 to 3.03).
:STATe <b>	Enable or disable reference.
:STATe?	Query state of reference.
:ACQuire	Use input signal as reference.
:REFerence?	Query reference value.
:DIGits <n>	Specify measurement resolution (4 to 7).
:DIGits?	Query resolution.
:AVERage	Path to configure and control the filter.
:TCONtrol <name>	Select filter type: (MOVing or REPeat).
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:STATe <b>	Enable or disable filter.
:STATe?	Query state of digital filter.
:VOLTage:AC	Path to configure AC voltage.
:NPLCycles <n>	Set integration rate (line cycles; 0.01 to 10).
:NPLCycles?	Query line cycle integration rate.
:RANGe	Path to configure measurement range:
[:UPPer] <n>	Select range (0 to 757.5).
[:UPPer]?	Query range.
:AUTO <b>	Enable or disable auto range.
:AUTO?	Query auto range.
:REFerence <n>	Specify reference (-757.5 to 757.5).

Table 10. SENSe command summary (cont.)

Command	Description
:VOLTage:AC	
:REFerence <n>	
:STATe <b>	Enable or disable reference.
:STATe?	Query state of reference.
:ACQuire	Use input signal as reference.
:REFerence?	Query reference value.
:DIGits <n>	Specify measurement resolution (4 to 7).
:DIGits?	Query resolution.
:AVERage	Path to configure and control the filter.
:TCONtrol <name>	Select filter type: (MOVing or REPeat).
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:STATe <b>	Enable or disable filter.
:STATe?	Query state of digital filter.
:DETector	Path to configure bandwidth:
:BANDwidth <NRf>	Specify bandwidth (3 to 300e3).
:BANDwidth?	Query bandwidth.
:VOLTage:DC	Path to configure DC voltage:
:NPLCycles <n>	Set integration rate (line cycles; (0.01 to 10).
:NPLCycles?	Query line cycle integration rate.
:RANGe	Path to configure measurement range:
[:UPPer] <n>	Select range (0 to 1010).
[:UPPer]?	Query range.
:AUTO <b>	Enable or disable auto range.
:AUTO?	Query auto range.
:REFerence <n>	Specify reference (-1010 to +1010).
:STATe <b>	Enable or disable reference.
:STATe?	Query state of reference (0 or 1).
:ACQuire	Use input signal as reference.
:REFerence?	Query reference value.
:DIGits <n>	Specify measurement resolution (4 to 7).
:DIGits?	Query resolution.

Table 10. SENSe command summary (cont.)

Command	Description
:VOLTage:DC	
:AVERage	Path to configure and control the filter.
:TCONtrol <name>	Select filter type: (MOVing or REPeat).
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:STATe <b>	Enable or disable filter.
:STATe?	Query state of digital filter.
:RESistance	Path to configure resistance:
:NPLCycles <n>	Set integration rate (line cycles; 0.01 to 10).
:NPLCycles?	Query line cycle integration rate.
:RANGe	Path to configure measurement range:
[:UPPer] <n>	Select range (0 to 101e6).
[:UPPer]?	Query range.
:AUTO <b>	Enable or disable auto range.
:AUTO?	Query auto range.
:REFerence <n>	Specify reference (0 to 101e6).
:STATe <b>	Enable or disable reference.
:STATe?	Query state of reference.
:ACQuire	Use input signal as reference.
:REFerence?	Query reference value.
:DIGits <n>	Specify measurement resolution (4 to 7).
:DIGits?	Query resolution.
:AVERage	Path to configure and control filter.
:TCONtrol <name>	Select filter type: (MOVing or REPeat).
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:STATe <b>	Enable or disable filter.
:STATe?	Query state of digital filter.

Table 10. SENSe command summary (cont.)

Command	Description
:FRESistance	Path to configure four-wire resistance:
:NPLCycles <n>	Set integration rate (line cycles; 0.01 to 10).
:NPLCycles?	Query line cycle integration rate.
:RANGe	Path to configure measurement range:
[:UPPer] <n>	Select range (0 to 101e6).
[:UPPer]?	Query range.
:AUTO <b>	Enable or disable auto range.
:AUTO?	Query auto range.
:REFerence <n>	Specify reference (0 to +101e6).
:STATe <b>	Enable or disable reference.
:STATe?	Query state of reference.
:ACQuire	Use input signal as reference.
:REFerence?	Query reference value.
:DIGits <n>	Specify measurement resolution (4 to 7).
:DIGits?	Query resolution.
:AVERage	Path to configure and control filter.
:TCONtrol <name>	Select filter type: (MOVing or REPeat).
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:STATe <b>	Enable or disable filter.
:STATe?	Query state of digital filter.
:TEMPerature	Path to configure temperature:
:NPLCycles <n>	Set integration rate (line cycles; 0.01 to 10).
:NPLCycles?	Query line cycle integration rate.
:REFerence <n>	Specify reference; -200° to 1372°C (Type K).
:STATe <b>	Enable or disable reference.
:STATe?	Query state of reference.
:ACQuire	Use input signal as reference.
:REFerence?	Query reference value.
:DIGits <n>	Specify measurement resolution (4 to 7).
:DIGits?	Query resolution.
:AVERage	Path to configure and control the filter.

Table 10. SENSe command summary (cont.)

Command	Description
:TEMPerature	
:AVERage	
:TCONtrol <name>	Select filter type: (MOVing or REPeat).
:TCONtrol?	Query filter type.
:COUNt <n>	Specify filter count (1 to 100).
:COUNt?	Query filter count.
:STATe <b>	Enable or disable filter.
:STATe?	Query state of digital filter.
:TCouple	Path to configure thermocouple:
:TYPE <name>	Select thermocouple type (J, K, or T).
:TYPE?	Query thermocouple type.
:RJUNction	Path to configure reference junction:
:RSELect <name>	Select reference type (SIMulated or REAL).
:RSELect?	Query reference type.
:SIMulated <n>	Specify simulated temperature in °C (0 to 50).
:SIMulated?	Query simulated temperature.
:REAL	Path to configure real reference junction:
:TCOefficient <n>	Specify temp coefficient (-0.09999 to 0.09999).
:TCOefficient?	Query temp coefficient.
:OFFSET <n>	Specify voltage offset at 0°C (-0.09999 to 0.09999).
:OFFSet?	Query voltage offset.
:FREQuency	Path to configure frequency.
:THReshold	Path to select the threshold voltage range:
:VOLTage	
:RANGe <n>	Select threshold range (0 to 1010).
:RANGe?	Query threshold range.
:REFerence <n>	Specify reference (0 to 1.5e7)
:STATe <b>	Enable or disable reference.
:STATe?	Query state of reference.
:ACQuire	Use input signal as reference.
:REFerence?	Query reference value.
:DIGits <n>	Specify measurement resoltuion (4 to 7).
:DIGits?	Query resolution.

Table 10. SENSe command summary (cont.)

Command	Description
:PERiod	Path to configure period.
:THReshold	Path to select the threshold voltage range:
:VOLTage	
:RANGe <n>	Select threshold range (0 to 1010).
:RANGe?	Query threshold range.
:REFerence <n>	Specify reference (0 to 1).
:STATe <b>	Enable or disable reference.
:STATe?	Query state of reference.
:ACQuire	Use input signal as reference.
:REFerence?	Query reference value.
:DIGits <n>	Specify measurement resolution (4 to 7).
:DIGits?	Query resolution.
:DIODe	Paths to configure diode test:
:CURRent	
:RANGe	Path to select range.
[:UPPer] <NRf>	Select range (0 to 1e-3)
[:UPPer]?	Query range.
:CONTinuity	Path to configure continuity test:
:THReshold <NRf>	Set threshold resistance (1 to 1000).
:THReshold?	Query threshold resistance.

Table 11. STATus command summary

Command	Description
:STATus	
:MEASurement	Path to control measurement event registers:
[:EVENt]?	Read the event register.
:ENABle <NRf>	Program the enable register.
:ENABle?	Read the enable register.
:CONDition?	Read the condition register.
:OPERation	Path to control operation status registers:
[:EVENt]?	Read the event register.
:ENABle <NRf>	Program the enable register.
:ENABle?	Read the enable register.
:CONDition?	Read the condition register.
:QUEStionable	Path to control questionable status registers:
[:EVENt]?	Read the event register.
:ENABle <NRf>	Program the enable register.
:ENABle?	Read the enable register.
:CONDition?	Read the condition register.
:PRESet	Return status registers to default states.
:QUEue	Path to access error queue:
[:NEXT]?	Read the most recent error message.
:ENABle <list>	Specify error and status messages for queue.
:ENABle?	Read the enabled messages.
:DISable <list>	Specify messages not to be placed in queue.
:DISable?	Read the disabled messages.
:CLEar	Clears all messages from Error Queue.

Table 12. SYSTem command summary

Command	Description
:SYSTem	
:PRESet	Return to :SYST:PRES defaults.
:POSetup <name>	Select power-on setup: (RST, PRESet or SAV0).
:POSetup?	Query power-on setup.
:VERSion?	Query rev level of SCPI standard.
:ERRor?	Query (read) Error Queue.
:AZERo	Path to set up autozero.
:STATe <b>	Enable or disable autozero.
:STATe?	Query autozero.
:KEY <NRf>	Simulate key-press (1 to 31; see Figure 5-10).
:KEY?	Query the last "pressed" key.
:CLEar	Clears messages from the Error Queue.
:BEEPer	Path to control beeper.
:STATe <b>	Enable or disable beeper.
:STATe?	Query state of beeper.
:LOCal	Take 2000 out of remote and restore operation of front panel controls (RS-232 only).
:REMote	Place 2000 in remote (RS-232 only).
:RWLock	Lockout front panel controls (RS-232 only).

Table 13. TRACe command summary

Command	Description
:TRACe[:DATA	Use :TRACe or :DATA as root command.
:CLEar	Clear readings from buffer.
:FREE?	Query bytes available and bytes in use.
:POINts <NRf>	Specify size of buffer (2 to 1024).
:POINts?	Query buffer size.
:FEED <name>	Select source of readings (SENSe[1], CALCulate[1], NONE.
:CONTrol <name>	Select buffer control mode (NEVer or NEXT)
:CONTrol?	Query buffer control mode.
:FEED?	Query source of readings for buffer.
:DATA?	Read all readings in the buffer.

Table 14. Trigger command summary

Command	Description
:INITiate	Subsystem command path:
[:IMMediate]	Initiate one trigger cycle.
:CONTinuous <b>	Enable or disable continuous initiation.
:CONTinuous?	Query continuous initiation.
:ABORt	Reset trigger system.
:TRIGger[:SEQuence[1]]	Path to program Trigger Layer:
:COUNt <n>	Set measure count (1 to 9999, or INF).
:COUNt?	Query measure count.
:DELay <n>	Set delay (0 to 999999.999 sec)
:AUTO <b>	Enable or disable auto delay.
:AUTO?	Query state of delay.
:DELay?	Query delay.
:SOURce <name>	Select control source (IMMediate, TIMer, MANual, BUS, or EXTernal).
:SOURce?	Query control source.
:TIMer <n>	Set timer interval (0 to 999999.999 sec).
:TIMer?	Request the programmed timer interval.
:SIGNal	Loop around control source.
:SAMPle	
:COUNt <NRf>	Specify sample count (1 to 1024).
:COUNt?	Query sample count.

Table 15. TEMPerature command summary

Command	Description
:UNIT	
:TEMPerature <name>	Select temperature measurement units (C, F, or K).
:TEMPerature?	Query temperature units.
:VOLTage	Path to configure ACV units.
:AC <name>	Select ACV measurement units (V, DB or DBM).
:DB	Path to set DB reference voltage.
:REFerence <n>	Specify reference in volts ($1e^{-6}$ to 1000).
:REFerence?	Query DB reference.
:DBM	Path to set DBM reference impedance.
:IMPedance <n>	Specify reference impedance (1 to 9999).
:IMPedance?	Query DBM reference impedance.
:AC?	Query ACV units.
[:DC] <name>	Select DCV measurement units (V, DB, or DBM)
:DB	Path to set DB reference voltage:
:REFerence <n>	Specify reference in volts (0 to 1000).
:RFFerence?	Query reference.
:DBM	Path to set DBM refernece impedance:
:IMPedance <n>	Specify reference impedance (1 to 9999).
:IMPedance?	Query reference impedance.
:DC?	Query DCV units.

Table 16. Models 196/199 device-dependent command summary

Mode	Command	Description
Execute	X	Execute other device-dependent commands.
Function	F0	DC volts
	F1	AC volts
	F2	2-wire ohms
	F3	DC current
	F4	AC current
	F5	ACV dB
	F6	Not valid
	F7	Frequency
	F8	Temperature
	F9	4-wire ohms

Range

	DCV	ACV	DCA	ACA	Ohms*	ACV dB	Freq
R0	Auto	Auto	Auto	Auto	Auto	Auto	—
R1	1V	1V	100mA	1A	1kΩ	1V	1V
R2	10V	10V	3A	3A	10kΩ	10V	10V
R3	100V	100V	3A	3A	100kΩ	100V	750V
R4	1000V	750V	3A	3A	1MΩ	750V	750V
R5	1000V	750V	3A	3A	10MΩ	750V	750V
R6	1000V	750V	3A	3A	100MΩ	750V	750V
R7	1000V	750V	3A	3A	100MΩ	750V	750V

*2-wire and 4-wire ohms

Zero (rel)	Z0	Zero disabled
	Z1	Zero enabled
	Z2	Zero enabled using a zero value (V)
Filter	P0	Filter disabled
	P1	Moving filter (count = 10)
	P2	Repeat filter (count = 10)
Rate	S0	0.1 PLC integration
	S1	Line cycle integration (16.67msec, 60Hz; 20msec, 50Hz)
	S2	10 PLC (166.67msec integration, 60Hz; 200msec integration, 50Hz)

Table 16. Models 196/199 device-dependent command summary (cont.)

Mode	Command	Description
Trigger mode	T0	Continuous on Talk
	T1	One-shot on Talk
	T2	Continuous on GET
	T3	One-shot on GET
	T4	Continuous on X
	T5	One-shot on X
	T6	Continuous on External Trigger
	T7	One-shot on External Trigger
Reading mode	B0	Readings from A/D converter
	B1	Individual readings from data store
	B2	All readings from data store (buffer dump)
Data store size	I0	Disable data store
	In	Data store of n (n=1 to 500), fill and stop
Interval	Q0	Default interval, 175msec (SELECT OFF)
	Qn	n=interval in milliseconds (15msec to 999999msec)
Value	V±nn.nnnn or V±n.nnnnnnE+n	Zero value, simulated reference junction temperature
Default conditions	L0	Restore factory default conditions and save (L1)
	L1	Save present machine states as default conditions
Data format	G0	Reading with prefix.
	G1	Reading without prefix.
	G2	Reading and buffer location with prefix.
	G3	Reading and buffer location without prefix.
	G4	Reading and channel with prefix.
	G5	Reading and channel without prefix.
	G6	Reading, buffer location, and channel with prefix.
	G7	Reading, buffer location, and channel without prefix.

Table 16. Models 196/199 device-dependent command summary (cont.)

Mode	Command	Description
SRQ	M0	Disable
	M1	Reading overflow
	M2	Data store full
	M4	Data store half full
	M8	Reading done
	M16	Ready
	M32	Error
EOI and bus hold-off	K0	Enable EOI and bus hold-off on X
	K1	Disable EOI, enable bus hold-off on X
	K2	Enable EOI, disable bus hold-off on X
	K3	Disable both EOI and bus hold-off on X
Terminator	Y0	CR LF
	Y1	LF CR
	Y2	CR
	Y3	LF
Status	U0	Send machine status word (199 format only)
	U1	Send error conditions (only supports no scanner, IDDC, IDDCO)
	U2	Send Translator word list (since Translator is not supported, replies with one space character)
	U3	Send buffer size
	U4	Send current value of "V" (199 format, equivalent to U7 for 196)
	U5	Send input switch status (front /rear) (199 format, equivalent to U8 for 196)
	U6	Send simulated temperature (set by H0)
Multiplex	A0	Auto/Cal multiplex disabled
	A1	Auto/Cal multiplex enabled
Delay	Wn	n=delay period in milliseconds, (0msec to 999999msec)

Table 16. Models 196/199 device-dependent command summary (cont.)

Mode	Command	Description
Display	Da	Display up to 12-character message (a=character)
	D	Cancel display mode
Scanning	N0	Open all - stop scanning or stepping if applicable
	N1	Close channel 1
	N2	Close channel 2
	N3	Close channel 1
	N4	Close channel 4
	N5	Close channel 5
	N6	Close channel 6
	N7	Close channel 7
	N8	Close channel 8
	N9	Close channel 9
	N10	Close channel 10
	N11	Step mode, max channel is 2
	N12	Step mode, max channel is 3
	N13	Step mode, max channel is 4
	N14	Step mode, max channel is 5
	N15	Step mode, max channel is 6
	N16	Step mode, max channel is 7
	N17	Step mode, max channel is 8
	N18	Step mode, max channel is 9
	N19	Step mode, max channel is 10
	N20	Open all - stop scanning or stepping if applicable
	N21	Scan mode, max channel is 2
	N22	Scan mode, max channel is 3
	N23	Scan mode, max channel is 4
	N24	Scan mode, max channel is 5
	N25	Scan mode, max channel is 6
	N26	Scan mode, max channel is 7
	N27	Scan mode, max channel is 8
	N28	Scan mode, max channel is 9
	N29	Scan mode, max channel is 10

Table 16. Models 196/199 device-dependent command summary (cont.)

Mode	Command	Description
Thermocouple	J0	Type J thermocouple
	J1	Type K thermocouple
	J2	Type T thermocouple
	O0	Simulated reference junction (for temperature function)
	O1	Real reference junction (for temperature function)
	H0	Set simulated reference junction temperature using "V" command; 0 to 50 (°C).

Table 17. Models 8840A/8842A device-dependent command summary

Mode	Command	Description
Function	F1	VDC (default)
	F2	VAC
	F3	2-wire kΩ
	F4	4-wire kΩ
	F5	mA DC
	F6	mA AC
	F7	Freq
	F8	Temp

Range

	VDC	VAC	kΩ*	mA DC	mA AC	Freq
R0	**	**	**	**	**	
R1	1V	1V	1kΩ	10mA	3A	1V
R2	10V	10V	10kΩ	10mA	3A	10V
R3	100V	100V	100kΩ	100mA	3A	100V
R4	1000V	750V	1MΩ	1A	1A	750V
R5	1000V	750V	10MΩ	3A	3A	750V
R6	1000V	750V	100MΩ	3A	3A	750V
R7	***	***	***	***	***	
R8	100mV	750V	100Ω	3A	3A	750V

*2-wire and 4-wire ohms
**Auto on
***Auto off

Reading rate	S0	Slow, 10 PLC
	S1	Medium, 1 PLC, 6½-digit resolution (default)
	S2	Fast, 0.1 PLC, 5½-digit resolution

Trigger mode		Trigger mode	Rear panel trigger	Auto delay
	T0 (default)	Internal	Disabled	—
	T1	External	Enabled	On
	T2	External	Disabled	On
	T3	External	Enabled	Off
	T4	External	Disabled	Off

Note: Delay is enabled by entering EXT TRIG mode while in local.

Offset (Rel)	B0	Offset off (default)
	B1	Offset on
Display	D0	Normal display (default)
	D1	Blank display

Table 17. Models 8840A/8842A device-dependent command summary

Mode	Command	Description
Suffix	Y0	Disable output suffix (default)
	Y1	Enable output suffix
Terminator	W0	Enable CR LF EOI (default)
	W1	Enable CR LF only
	W2	Enable CR EOI only
	W3	Enable CR only
	W4	Enable LF EOI only
	W5	Enable LF only
	W6	Enable EOI only
	W7	Disable all output terminators
Clear	*	Device clear (resets 8842A to default conditions)
	X0	Clear error register
Single-trigger	?	Trigger measurement
GET	G0	Get instrument configuration (function, range, speed, trigger)
	G1	Get SRQ mask
	G2	Get calibration input prompt (generates error message 51)
	G3	Get user-defined message (replies with 16 space characters)
	G4	Get calibration status (replies with "1000")
	G5	Get IAB status (input F/R, autorange on/off, offset on/off)
	G6	Get YW status (suffix enabled/disabled, terminator selection)
	G7	Get error status
	G8	Get instrument ID (replies with "FLUKE,8842A,0,EMUL")
	G9	Get status of JKM commands (temp. units; TC type and junction) String = 1jkm

Table 17. Models 8840A/8842A device-dependent command summary

Mode	Command	Description
GET (cont.)	G10	Get closed channel number String = 10nn Where: nn = 00 (all open) 01 through 10 (closed channel)
	G11	Get simulated reference junction temperature String = xx.xxx (in °C) Note: G2 valid only in calibration mode.
PUT	P0	Put instrument configuration (function, range, speed, trigger)
	P1	Put SRQ mask
	P4	Set simulated junction temperature; 0 to 50 (°C) Default temperature = 23°C
PUT format	N <value> P0 N <value> P1 N <value> P4	
Thermocouple type	K0	Type J thermocouple (default)
	K1	Type K thermocouple
	K2	Type T thermocouple
Temperature unit	J0	°C (default)
	J1	K
	J2	°F
Thermocouple reference junction	M0	Select simulated junction (default)
	M1	Select real junction (channel 1 for 2001-TCSCAN card)

Table 17. Models 8840A/8842A device-dependent command summary

Mode	Command	Description
Scanner channel	Ln	Control specified channel of internal scan card where: n = 0 (Open all channels) 1 through 10 (close specified channel) Note: For 4-wire ohms, only channels 1 through 5 are valid due to automatic channel pairing.
SRQ mask values	00 01 16 32	SRQ disabled (default) SRQ on overrange SRQ on data available SRQ on any error Note: Add SRQ mask values for combinations. Example: 33 for SRQ on overrange or any error.

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